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МЕТОДИЧНІ ВКАЗІВКИ

до організації самостійної роботи

з дисципліни

ІНОЗЕМНА МОВА

(англійська мова)

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Укладач: О. В. Анісенко

Рецензент: доц., канд. пед. наук О. Л. Ільєнко

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INTRODUCTION

This course is for the students studying English for scientific and technical purposes (ESP). These educational materials are designed for the students of the 2st course of specialty “Heat and gas supply and ventilation” to develop their knowledge and skills in English language.

The manual is based on the authentic texts concerning English for heat and gas supply and ventilation. It also has the tasks for reading, translating, lexical and grammar tasks. It has two parts: English for heat and gas supply and ventilation and supplementary texts.

The manual can be also recommended for students’ self-study. It is expected to teach students working at English texts on their own, to increase the level of their knowledge and to form foreign communicative competence.

UNIT 1

1. Read and translate the text:

WATER AND AIR POLLUTION PROBLEMS

Water and air pollution are the two main factors that destroy the environment in big cities. Paris has no industry, so the Seine is not polluted by industrial effluents but by sewer waters. However, this problem is being solved by building pollution control stations in a Paris suburb. The sewage is channeled into them and cleansed before it goes into the Seine. When visiting these installations, one can often see how pure water the processed water is – the engineers who work there drink it quite cheerfully.

Water is purified by mechanical and biological methods. The purified water is treated with chlorine and released into the rivers, whence it enters the water supply systems where it undergoes further and finer treatment.

Air is mainly polluted by heating systems and cars. When you look at a modern city from a hill top you get the impression of vapour (smog) lingering over the city especially when there are no winds which can air the city. However, when there is no wind they have smog. As regards heating, mazut and gas are used rather than coal for last years. The poisoned air is the most modern quarters of the city. District heating is an effective method. Several heat-and-power plants generate steam, which is piped underground all round the city.

As for cars you know, of course, how heavy traffic is in big cities. The slower the traffic, the more exhaust fumes are. This problem will be solved in the near future.

The acuteness of the problem depends on how well the country is developed and on the number of the cars. Many of these problems are international in nature.

2. Find the Russian word with the same root as the English:

1. industry	промышленность	7. smog	густой туман с дымом и копотью
2. channel	пускать по каналу		
3. process	обрабатывать	8. effective	эффективный
4. method	способ	9. generate	производить
5. chlorine	хлор	10. international	международный
6. modern	современный	11. nature	характер

3. Match the words from the left-side column with their translation from the right-side column:

pollution control stations	очень загрязненный район
industrial effluents	тепло и электростанции
processed water	выхлопные газы
treated with chlorine	подвергаться очистке
purified water	современные требования
water supply system	очистительные сооружения
undergo purification	централизованное теплоснабжение

heating systems	промышленные сточные воды
air the city	острота проблемы
modern requirements	обработанный хлором
a heavily polluted area	система водоснабжения
district heating	проветривать воздух
heat and power plants	системы отопления
exhaust fumes	обработанная вода
to pipe steam underground	подавать пар по подземным трубам
acuteness of a problem	очищенная вода

UNIT 2

1. Read and translate the text:

HEATING, VENTILLATION AND AIR CONDITIONING

When designing a small home that is to be air-conditioned, many factor must be considered to achieve economical installation and low operating costs.

A system controlling the temperature, humidity and filtering of the air is adequate for home conditioning.

Units with very accurate controls, as used in industrial or large commercial installations are not required for small residence.

A house to be efficiently and economically air-conditioned should be designed so that the heat gain is as low as possible. This is achieved by proper orientation, location of glass areas, insulation and ventilation of roof. Natural elements such as trees, planting and water areas should be utilized to provide shade and cooling.

For the sake of economy and efficiency in the small home the central core plan is often advised. The central service core has the following advantages:

1. Economical structure. 2. Grouped plumbing. 3. Efficient ductwork. 4. Flexibility of plan around core to utilize orientation.

The air conditioning unit should be located in the center of the plan to minimize ductwork and insulation. Oversize units are as inefficient as undersized conditioning units. The proper unit that will operate steadily, rather than in surges of cooling periods, will provide better results, because between surges humidity builds up and destroys the comfort balance. Ideal interior humidity is 50%.

The cost and availability of electricity and water should be obtained to estimate operating costs of equipment. If supply of water is limited or expensive, conditioning systems with water saving devices are necessary.

consider	учитывать
achieve	достигать, получать
humidity	влажность
require	требовать
provide	обеспечивать
advise	советовать
ductwork	трубопровод

flexibility	гибкость
steadily	постоянно
surge	подъем, рост
build up	создавать постепенно
destroy	разрушать
equipment	оборудование
availability	наличие
obtain	получать
estimate	оценивать
expensive	дорогой
necessary	необходимый

2. Find the Russian word with the same root as the English:

economical	экономичный	design	проектировать
control	контролировать	orientation	размещение, установка
filter	фильтровать, процеживать	natural	естественный
adequate	соответствующий требованиям	utilization	использование
		structure	сооружение, конструкция
accurate	точный		
commercial	заводской	minimize	уменьшать
residence	жилье, дом	conditioning	кондиционирование
efficiently	рационально	limit	ограничивать
efficiency	эффективность		
efficient	рациональный		

3. Match the words from the left-side column with their translation from the right-side column:

to be air conditioned	увеличение тепла
economical installation	точная регулировка
home conditioning	площадь застекления
accurate control	водоизмерительные счетчики
commercial installation	текущие (эксплутационные) расходы
small residence	время охлаждения
heat gain	проект с установкой оборудования в центре
glass area	устройство меньше заданного размера
natural elements	устройство кондиционирования воздуха
central core plan	проветривать
air conditioning unit	естественные (природные) элементы
oversize unit	уровень комфорта
undersize unit	домашнее кондиционирование
cooling period	небольшой жилой дом
comfort balance	устройство больше заданного размера
operating costs	заводская установка
water saving device	экономичная установка

UNIT 3

1. Read and translate the text:

WATER AND WATER SUPPLY

Centralized water supply dates back to 2500 BC. Ancient Egypt had complex engineering structures for the purpose. Yet to this day the percentage of the population enjoying centralized water supply on the African continent and in Asia, too, is very low.

In our country, at the time of the Revolution of 1917, only one third of the towns had running water laid on, and, then, as a rule, only in the central part of the town. In the pre-war period of industrial development running water reached millions of flats all over the country. Water supply of the systems are practically all in the western and central parts of European Russia, were destroyed during the war and had to be built anew.

Fresh water shortage was first mentioned soon after the end of the Second World War. The first to feel the stint was Europe. The problem came to many as a complete surprise, something in the nature of an unexpected “catastrophe”. This catastrophe, however, should have been foreseen, for it follows logically from the development of human life on our planet and of Man’s industrial activity.

In the absence of centralized water supply, a man can do with about 25 litres of water a day for his various personal needs. But in the modern city water consumption per person is much higher. An average of 300 to 500 litres of water is spent daily on household and sanitary needs per one inhabitant of a modern city. You can see this vastly exceeds the necessary minimum of 25 litres. Why the discrepancy (difference)? Not because people leave their taps open. Because water is so abundant nobody thinks twice about taking a shower, or a bath, using the washing machine, washing the car, etc. The volume of water consumption is indicative not only of the efficiency of the water supply but also of the population’s living standards.

One need in water is growing. Simultaneously, the globe’s population is growing. In the past century the consumption of water by the world’s largest cities, such as Paris, London, Berlin and Moscow, has grown 80 to 100 times. During the famous heat wave of 1972 Moscow “drank” almost 5,000,000 cubic metres of water a day. This staggering figure seems to confirm the immediacy of the water dearth problem. In actual fact, however, the problem consists not so much in where to get pure water but in how to deliver it to where people need it.

date back	относится
enjoy	зд. иметь
low	низкий
lay on	прокладывать
pre-war	довоенный
shortage	нехватка, недостаток
stint	ограничение, предел; ограничивать
complete	полный

unexpected	неожиданный
foresee	предвидеть
follow	следовать
human	человеческий
absence	отсутствие
various	различный
consume (consumption)	потреблять (потребление)
average	средний
spend	тратить
household	семья
inhabitant	житель
exceed	превышать
tap	кран
abundant	имеющийся в изобилии
be indicative	указывать, показывать
grow	расти, увеличиваться
globe	земной шар
stagger	поражать, потрясать
immediacy	безотлагательность, неотложность
deliver	доставлять

2. Find the Russian word with the same root as the English:

centralized	центральный	logically	Логически
complex	сложный	industrial activity	промышленная
engineering	технические		деятельность
structures	сооружения	personal	
		sanitary	личный
industrial	промышленный	efficiency	гигиенический
practically	практически	figure	эффективность
surprise	удивление	actual fact	цифра
nature	характер		в действительности

3. Match the words from the left-side column with their translation from the right-side column:

centralized water supply	стиральная машина
running water	проблема нехватки воды
water supply system	потребление воды
fresh water shortage	централизованное водоснабжение
water consumption	население земного шара
washing machine	водопровод
living standard	чистая вода
pure water	зд. сильная жара
globe’s population	система водоснабжения
water dearth problem	уровень жизни
heat wave	нехватка пресной воды

UNIT 4

1. Read and translate the text:

WATER POLLUTION IN THE USA

The problem of solving pollution from the technical view-point has turned out to be more difficult than expected.

First of all, it became evident that in certain reservoirs such great qualitative changes had taken place that it was practically very difficult to return them to their former state. Irreversible changes have taken place in the Great Lakes, because the disturbances in the organic environment of the lakes are irremediable.

New types of pollution are being discovered. Not so long ago a stable and dangerous pollutant called PChB (polychlorinated biophenyl) was identified. The danger is doubled because of the fact that PchB accumulates in the bottom sediments and is preserved in rivers for many years after it is no longer dumped into them. The concentration of this pollutant is very great in the Great Lakes, in such rivers as the Hudson, the Connecticut, the Mississippi, the Missouri, the Ohio, the Sacramento, the Rio Grande, and the Yukon.

The difficulties in combating PChB also lie in the fact that so far it has not been accurately established what kind of pollutants bring about its formation in reservoirs. The variety of polluting sources is growing. The expansion of urban territories with asphalt-covered roads, the increase in the production and the complex composition of chemical substances and combinations used in everyday life had led to the increasing role in polluting water resources played by the drainage from the territory of cities, towns and villages. Besides that, the sphere of water pollution is broadening. During the recent years there appeared a new problem – the pollution of ground water. The pollution of ground water is caused by a great variety of reasons: numerous waste dumps scattered all over the area and exposed to the influence of rainwater, polluted surface reservoirs, the disposal of sewage from factories (waste matter as well), and the use of water on oil-fields.

Water supply at the expense of ground water plays an important role in the lives of many towns and cities and in the production of foodstuffs. The water supply of 12-15 million families depends upon individual underground boring wells, which have no purifying facilities. 71 per cent of the public water supply is based upon the ground water. The complexity of the issue is in the fact that the physico-chemical processes of the transformation of ground water are still not fully explored.

Internal economic and political problems are impediments to solving the pollution problem. For several years conflicts have been taking place between private companies, the federal government and the authorities of separate states. The Association of the Chemical Industry for example, has declared that it is unrealistic to expect the modernization of purifying technology, as required by law. Quite often local authorities do not plan building a system of second time purification. Discussions are in the progress, while polluted water runs into

reservoirs creating a threat to the health of the people, and complicating the second utilization of sewage.

The arms race and the energy crisis have an impact on the problem of reproduction of water resources. Attempts to overcome the energy crisis have brought about the postponement of many water purification measures.

The problem of providing the country with water resources is still far from being solved.

solve	решать
turn out	оказываться
expect	ожидать, полагать
evident	очевидный
qualitative	качественный
take place	происходить , случаться
irreversible	необратимый
disturbance	нарушение
discover	открывать
double	удваиваться, быть вдвое больше
bottom	дно
sediment	осадок, отстой
preserve	сохранять
dump	сбрасывать
establish	устанавливать
bring about	приводить
cover	покрывать
lead (led)	приводить
increase	увеличивать
appear	появляться
besides	кроме того
broaden	расширяться
cause	вызывать, являться причиной
scatter	разбрасывать
expose	подвергать действию, оставлять незащищенным
at the expense of	за счет
foodstuffs	пищевые продукты
complexity	сложность
issue	спорный вопрос, проблема
impediment	препятствие
declare	объявлять
require	требовать
the meantime	тем временем
create	создавать
threat	угроза
complicate	затруднять, усложнять

impact	сильное воздействие, влияние
attempt	попытка
overcome	преодолеть
postponement	откладывание, задержка
provide	обеспечивать

2. Find the Russian word with the same root as the English:

reservoir	водоем, водохранилище	composition	состав
	вид	sphere	область
type	устойчивый, стойкий	drainage	дренажная система
stable	определять		канализация
identify	накапливать	individual	личный
accumulate	бороться	base	основываться
combat	разнообразие	transformation	преобразование
variety	точно	conflict	столкновение
accurately	образование	private	частный
formation	расширение	authority	власти
expansion	городской	unrealistic	нереальный
urban	производство	utilization	использование
production	сложный	reproduction	воспроизводство
complex		in progress	развиваться, вестись

3. Match the words from the left-side column with their translation from the right-side column:

former state	местные власти
organic environment	удаление сточных вод
dangerous pollutant	много причин
polluting sources	очистительное сооружение
chemical substance	грунтовая вода, подпочвенные воды
everyday life	коммунальная водопроводная система
ground water	свалка
a great variety of reasons	прежнее состояние
waste dumps	экологически чистая окружающая среда
disposal of sewage	вторичная очистка
underground boring well	выкопанный колодец под землей
purifying facility	опасный загрязняющий агент
public water supply	повседневная жизнь
local authorities	источники загрязнения
second time purification	химическое вещество

UNIT 5

1. Read and translate the text:

WATER RESOURCES OF THE USA

The USA is one of the first countries whose developing economy has met with a shortage of pure fresh water. Such conflicting situations have been caused by the exceptionally rapid growth of water consumption and by the constancy of the size of river runoff. The water crisis began to show at the beginning of the 60s. It was then when the gigantic projects were born to transport fresh water from Canada and Alaska to the main territory of the USA. At the end of 60s it became evident that the problem could not be solved by purifying utilized water.

By spending large sums of money on developing gigantic desalination plants it became clear that by channeling the runoff from the neighbouring territories and from the ocean an increase in the volume of polluted water would be brought about, which even at present overfills the rivers and lakes of the country.

It is the runoff which can be used without a full regulation of rivers by hydrotechnical installations. It is possible by recycling the same volume of water, which claims great requirements to the quality of their purification.

The main increase in water consumption takes place in that sphere of national economy, where water is necessary principally for cooling purposes – in industry, especially in heat-power engineering.

How can water losses be replenished? It is necessary to note the evergrowing consumption of ground water. The removal of considerably greater volumes of ground water that are taken at present will not diminish their total storage for a long time. Water supply at the expense of ground water is also convenient to satisfy the every day necessities of the population.

Other reserves that can be used are the water of the ocean. A wide substitution of fresh water for salt water for cooling purposes is assumed, mainly in heat-power engineering.

Over one quarter of the whole consumption of water will become possible due to the use of seawater. As concerning the abovementioned projects according to which fresh water is to be transported from Canada and Alaska and the entailed possibility to use the great reserves of hydropower of the western part of the continent, they have been cancelled.

develop	развиваться
pure	чистый
cause	вызывать, являться причиной
exceptionally	чрезвычайно
rapid	быстрый
growth	рост
constancy	постоянство
be born	родиться
become	стать, становиться
evident	очевидный, явный

solve	решать
spend	проводить, тратить
clear	чистый, ясный, понятный
neighbouring	соседний
increase	увеличиваться
overfill	переполнять
use	использовать, применять
recycle	проходить повторную обработку
take place	происходить, случаться
claim	требовать

2. Find the Russian word with the same root as the English:

economy	хозяйство, экономика, народное хозяйство
situation	положение
gigantic	большой
project	проект, программа
to transport	перевозить, транспортировать
utilized	использованный
regulation	регулирование, упорядочение
industry	промышленность
reserve	запас

3. Match the words from the left-side column with their translation from the right-side column:

fresh water	удовлетворить потребности
water consumption	прибрежная гидротехническая установка
river runoff	большие требования
purifying utilized water	пресная вода
desalination plant	для охлаждения
to channel the runoff	постоянно растущая потребность
rivers by hydrotechnical installation	загрязненная вода
polluted water	за счет грунтовых вод
bring about (brought)	что касается
great requirements	потребление воды
for cooling purpose	речной сток
evergrowing consumption	проводить сток
at the expense of ground water	очистка использованной воды
to satisfy the necessities	вызывать, осуществлять
as concerning	опреснительная установка

UNIT 6

1. Read and translate the text:

PANEL HEATING

(1) Heating and ventilation are two branches of engineering which are very closely connected and concerned with providing a required atmospheric environment, former with respect to heat supply to produce a desired temperature for maintaining comfort and health, the latter with supply and removal of air often with emphasis on contamination of the air.

(2) Heating prevents the too rapid loss of heat from the body. By heating the ambient air of walls, ceiling or floor the rate of heat loss from the body is controlled. The determination of the capacity or size of the various components of the heating system is based on the fundamental concept that heat supplied to a space equals heat lost from the space. The most widely used system of heating is the central heating, where the fuel is burned in one place – the basement or a specially designed room and from which steam, hot water or warm air is distributed to adjacent and remote spaces to be heated.

(3) There two most common systems of heating – hot water and steam. Both systems are widely used nowadays. A hot-water system consists of the boilers and a system of pipes connected to radiators. They are suitably located in rooms to be heated. The pipes, usually of steel and copper, feed hot water to radiators or convectors which give up their heat to the room. The cooled water is returned to the boiler for reheating.

(4) As for steam systems, steam is generated usually in the boiler and then led to the radiators through or by means of steel or copper pipes. The steam gives up its heat to the radiators and the radiator to the room and the cooling of the steam condenses it to water. The condensate is returned to the boiler either by gravity or by a pump. The air valve on each radiator is necessary for air to escape. Otherwise it would prevent steam from entering the radiator.

(5) Recent efforts to conceal heating equipment have resulted in an arrangement where hot water or steam is circulated through distribution units embedded in the building construction. Panel heating is a method of introducing heat to rooms in which the emitting surfaces are completely concealed in the floor, walls, or ceiling. The heat is disseminated from such panels partly by radiation and partly by convection, the relative amounts depending on the panel location. Ceiling panels release the largest proportion of heat by radiation and floor panels - the smallest. The proportion of heat disseminated by radiation and convection is also dependent on panel-surface temperatures. The basic advantage of a panel heating system is that of comfort.

(6) Application of certain panels is frequently restricted by structural details. Other factors to be considered are type of occupancy, furniture or equipment location, large glass areas, heat-storing capacity of building construction, room height, climate and first cost.

As for fuels used for heating buildings they include coal, oil, manufactured and natural gases and wood. There are two other sources: electricity and steam. Nowadays gas fuel is being used on an increasing level.

1. engineering	1. техника, строительство
2. closely	2. тесно, близко
3. concern	3. связывать
4. requirement	4. требование
5. with respect to	5. что касается
6. desire	6. желать
7. maintain	7. поддерживать
8. removal	8. удаление
9. supply	9. снабжать
10. fuel	10. топливо
11. burn	11. гореть
12. basement	12. фундамент, подвал
13. design	13. проектировать
14. adjacent	14. смежный, соседний
15. remote	15. отдаленный
16. common	16. обычный
17. suitably	17. подходяще, в соответствии
18. locate	18. размещать
19. feed	19. подавать, снабжать
20. give up	20. прекращать
21. cool	21. охлаждать
22. reheat	22. повторно нагревать
23. as for	23. что касается
24. through, by means of	24. посредством с помощью
25. generate	25. производить
26. lead (led, led)	26. вести, направлять
27. return	27. возвращать
28. pump	28. насос
29. valve	29. клапан
30. escape	30. уходить, улетучиваться, просачиваться
31. prevent	31. предохранять
32. conceal	32. скрывать
33. disseminate	33. распространяться
34. release	34. выделять
35. claim	35. требовать, предъявлять требования
36. advantage	36. преимущество
37. application	37. применение
38. consider	38. рассматривать, учитывать
39. occupancy	39. занятость, владение
40. increase	40. увеличивать(ся)

2. Match the words from the left-side column with their translation from the right-side column:

1. cooling (4)	1. потолок
2. space (1)	2. обеспечивать
3. maintain (1)	3. окружающая среда
4. removal (1)	4. паровое отопление
5. contamination (1)	5. определение
6. loss (2)	6. получать, приобретать
8. equal (2)	8. удаление
9. heat supply (1)	9. потеря
10. environment (1)	10. точный
11. to obtain (2)	11. загрязнение
12. determination (2)	12. охлаждение
13. provide (1)	13. поддерживать
14. steam heating (3)	14. пространство
15. ceiling (2)	15. отопление

3. Find the Russian word with the same root as the English:

to produce	производить
occupants	жители
concept	представление
radiation	излучение
transmission	передача
location	расположение
generate	производить
condense	сгущать
circulate	распределять
manufacture	производить

UNIT 7

1. Read and translate the text:

ALL-YEAR CONDITIONING, VENTILLAION, GAS SUPPLY

(1) Air conditioning implies the control of temperature, humidity, purity and motion of the air in an enclosure. In our modern world of science and highly developed technology air conditioning is of great importance for industrial processes and for human comfort. Air conditioning for human comfort is employed in large and small installations, such as theatres, office buildings, department stores, residences, airplanes, railways, cars and submarines. According to their purpose air conditioning systems may be described as winter, summer and all-year systems.

(2) All year-conditioning systems must provide means for performing all the processes required for winter and summer air conditioning. The basic pieces of

equipment are the filters, preheat coils, humidifiers, dehumidifiers, reheat coils, additional cooling coils, fans and controls. The control of air purity can be achieved in various degrees. As a minimum control some sort of filtering must be done near the entrance of the air-conditioning system. Possibly the most efficient filtering device is the electrostatic precipitator.

(3) In order to establish the size and operation requirements of an air-conditioning system, the maximum probable heating and co-demands have to be calculated. The maximum probable heating demand is usually for winter air conditioning and it involves heating and humidifying. The maximum probable cooling demand is generally for summer applications and requires cooling and dehumidifying. The inside design conditions depend upon the purpose for which air conditioning is used. Certain industrial process requirements and human comfort are the two major factors to be considered. With ever increasing tendency to use air-conditioning a building engineer must have good knowledge of the subject.

(4) As far as ventilation is concerned the purpose of ventilation is to carry away excess heat and odours. In buildings such as homes, the leakage of air through cracks on doors and windows is usually sufficient to meet this requirement. Although ventilation was formerly concerned with the supply of fresh air and the removal of hot and contaminated air from the space it is also associated with cleaning of air.

(5) Industrial buildings often present special problems in ventilation. There are certain industrial processes that are accompanied by the production of air-born dust, fumes, toxic vapours and gases which are hazardous to the health of workers. Three types of ventilation are in use so that to control dangerous gases and dusts: exhaust systems, dilution systems and combination of both.

(6) Another indispensable part of modern amenities is gas supple. At the present time natural gas is put to large-scale economic use. The principal utilization of natural gas is as clean, convenient, economical source of heat. In homes it is used for cooking, water heating, and refrigeration for food as well (а также) for space heating. Nowadays most of the homes are heated by natural gas and the number of gas-supplied homes was increasing at a rate limited chiefly by the ability of steel industry to produce the pipe through which the gas is transported. Natural gas supply is used also as a heat source in commercial establishments such as restaurants and bakeries for cooking and in stores, offices and other commercial buildings for heating and comfort cooling.

1. imply	1. предполагать, означать
2. motion	2. движение
3. enclosure	3. огороженное место
4. human	4. человеческий
5. employ	5. использовать
6. provide	6. обеспечивать
7. means	7. средства
8. require	8. требовать

9. basic	9. основной
10. preheat coils	10. змеевик предварительного нагрева
11. reheat	11. повторный нагрев
12. humidifier	12. увлажнитель
13. dehumidifier	13. осушитель
14. fan	14. вентилятор
15. achieve	15. достигать, получать
16. entrance	16. вход
17. in order to	17. для того чтобы
18. operational requirements	18. требования к эксплуатации
19. heating demand	19. расход (потребление) тепла
20. involve	20. включать
21. application	21. применение
22. inside	22. внутри
23. condition	23. условие
24. purpose	24. цель
25. as far … is concerned	25. что касается
26. assembly	26. зд. скопление людей
27. carry away	27. уносить
28. excess	28. излишек
29. leakage	29. утечка, просачивание
30. crack	30. трещина, щель
31. to meet requirement	31. удовлетворять требованию
32. accompany	32. сопровождать
33. air-born dust	33. пыль, находящаяся в воздухе
34. hazardous	34. опасный для здоровья
35. exhaust system	35. вытяжная система
36. dilution	36. разжижение, растворение
37 convenient	37. удобный
38. a number of	38. число
39. rate	39. скорость, темп
40. establishment	30. учреждение

2. Match the words from the left-side column with their translation from the right-side column:

1. modern (1)	1. удобство
2. human (2)	2. особый
3. technology (1)	3. современный
4. comfort (1)	4. человеческий
5. residence (1)	5. стремление
6. tendency (3)	6. связывать
7. associate (4)	7. естественный
8. special (5)	8. техника
9. natural (5)	9. жилище

3. Find the Russian word with the same root as the English:

1. air conditioning	1. жилые дома
2. environment	2. тщательное регулирование
3. close control	3. отопление помещения
4. provide	4. установки
5. supply of air	5. окружающая среда
6. removal of air	6. кондиционирование воздуха
7. contaminated air	7. обеспечивать
8. space heating	8. вывод воздуха
9. residential buildings	9. загрязненный воздух
10. installations	10. подача воздуха

4. Find the Russian equivalents to the following words and word combinations:

1. humidity	1. увлажнять
2. purity	2. универсальные магазины
3. department stores	3. чистота
4. sound knowledge	4. глубокие знания
5. excess heat	5. очистка воздуха
6. cleaning of air	6. экономичный источник
7. fumes	7. коммерческие здания
8. hazardous to health	8. запахи, испарения
9. modern amenities	9. опасный для здоровья
10. economical source	10. современные удобства
11. commercial buildings	11. влажность
12. humidify	12. избыток тепла

UNIT 8

1. Read and translate the text:

WATER SUPPLY

(1)Water is an important part of nature which surrounds us and of those natural conditions we are changing constantly and intensively: the flora, the soil, the mountains, mineral resources, the deserts, the marches, the steppes and the taiga.

(2) Vast depressions in the earth are filled with water through the medium of natural water sources such as rivers, lakes, etc. over the earth’s surface. These bodies of water are classified as inland lakes and are excellent sources of water. Often a water body deep in the soil consists of a sand or gravel stratum which connects or empties into the basin of an inland lake and provides a splendid source of water supply through the medium of a drilled well.

(3) Man uses water for domestic and sanitary purposes and returns it to the source through sewage disposal system. It is of prime importance that the supply

must be protected against pollution, because no one can predict how disastrous may be the results.

(4) An adequate supply of pure, wholesome and palatable water is essential to the maintenance of high standards of health and to provide the convenience and comfort to the community. In some localities water is available in unlimited quantities and converting it to use is not a difficult problem. This is especially true of towns situated on large inland lakes or rivers. But there are cities where geographical location requires elaborate systems of water supply, and to provide a satisfactory supply of water in these localities becomes a large engineering task.

(5) The importance of a sufficient supply of water for domestic and industrial purpose has long been a deciding factor in the location of cities. The earliest settlers realized this need and took advantage of natural water resources by establishing colonies in close proximity to them.

(6) Water may be taken from any source of water for human consumption after it has undergone a preliminary treatment to assure its purity. As man's communities grew in population, the demand for water increased and the need for protection of the source of water supply against the possibility of contamination became evident. Progress and civilization have called for elaborate and various systems and methods of water treatment.

1. surround	1. окружать
2. soil	2. почва
3. dessert	3. пустыня
4. marsh	4. болото
5. depression	5. низина, впадина
6. through the medium	6. посредством, при помощи
7. surface	7. поверхность
8. deep	8. глубокий
9. empty	9. пустой
10. drilled well	10. пробуренная скважина (колодец)
11. domestic	11. домашний, бытовой
12. return	12. возвращаться
13. wholesome	13. здоровый
14. palatable	14. вкусный
15. essential	15. важный, необходимый
16. maintain	16. поддерживать, сохранять
17. convenience	17. удобство
18. quantity	18. количество
19. convert	19. превращать
20. elaborate	20. тщательно разработанный, сложный
21. satisfactory	21. удовлетворительный
22. sufficient	22. достаточный
23. decide	23. решать
24. earliest settlers	24. первые поселенцы
25. realize	25. понимать, осознавать

26. take advantage	26. эксплуатировать
27. proximity	27. близость, соседство
28. consumption	28. потребление
29. undergo	29. подвергаться
30. preliminary treatment	30. предварительная обработка
31. community	31. община, поселение
32. call for	32. требовать, предусматривать

2. Match the words from the left-side column with their translation from the right-side column:

1. natural water sources	1. обработка воды
2. body of water	2. загрязнение
3. inland lake	3. при помощи, посредством
4. water supply	4. материковые озера
5. water treatment	5. естественные источники воды
6. purity	6. водный массив
7. contamination	7. водоснабжение
8. sewage disposal system	8. влага
9. pollution	9. потребление
10. through the medium	10 беспримесность
11. consumption	11. загрязнение (заражение)
12. moisture	12. система удаления сточных вод
13. stratum	13. слой, пласт

3. Find the Russian word with the same root as the English:
cycle, atmosphere, vary, proportion, phenomenon, reservoir, depression, classify, gravel, sanitary, domestic, standard, modern, location, protection, mineral, resources, flora, community.

UNIT 9

1. **Read and translate the text:**

SEWERAGE

(1)The problem of protecting natural water resources has grown very urgent for many countries since the beginning of the second half of the 20th century. The rivers, lakes and ground water contain today a considerable amount of the products of mechanical, chemical and biological pollution due to the development of human society, social and technical progress.

(2) The waste products that result from the daily activities in a community are of two general types: the liquid waste as sewage and the solid wastes, known as refuse. Sewage may be also divided according to its source into the following three classes. The sewage from residences, institutions and business buildings is called domestic sewage, sanitary sewage or house sewage; the resulting from industrial

processes is known as industrial waste, and that of from run-off during storms is called storm sewage. A combination of domestic sewage, industrial waste and storm water is called combined sewage.

(3) Sewage and refuse must be removed promptly in order to avoid endangering the health of the community. The removal of all kinds of sewage is usually accomplished by means of sewers. The sewers are placed in the streets at several feet below the ground surface. The entire system of sewers including a sewage treatment plant is known as a sewerage system.

(4) The method of sewage treatment to be adopted in a particular case will depend entirely on local conditions. The usual methods of sewage treatment consist of preliminary treatment alone or primary treatment followed by secondary treatment. During primary treatment the larger and heavier solid particles settle out from the liquid. Secondary treatment is required to remove decomposable materials from the sewage. An auxiliary treatment, which may be used with primary or secondary treatment is disinfection or the killing of the most of the bacteria in the sewage by means of chemicals.

1. urgent	1. острый
2. considerable	2. значительный
3. waste products	3. продукты отхода
4. result from	4. происходить в результате, проистекать
5. sewage	5. сточные воды
6. refuse	6. твердые отбросы
7. domestic sewage	7. бытовые сточные воды
8. run-off storm run-off	8. сток, стекание; отбросы, отходы ливневый расход
9. remove	9. удалять
10. removal	10. удаление
11. promptly	11.быстро, безотлагательно, немедленно
12. endanger	12. подвергать опасности, угрожать
13. accomplish	13. выполнять
14. by means of	14. с помощью, посредством
15. place	15. помещать, располагать
16. ground surface	16. поверхность земли
17. treatment	17. обработка
18. entirely	18. полностью
19. preliminary	19. предварительный
20. primary	20. первичный
21. secondary	21. вторичный
22. auxiliary	22. дополнительный

2. Match the words from the left-side column with their translation from the right-side column:

1. waste products	1.канализационная труба (коллектор)
2. refuse	2. первичная обработка
3. domestic sewage	3. промышленные сточные воды

4. industrial waste	4. канализация (процесс удаления)
5. sewer	5. водоочистное сооружение (станция)
6. sewerage	6. твердые отбросы
7. treatment plant	7. сточные воды
8. primary treatment	8. химикалии
9. chemicals	9. загрязнение
10. pollution	10. водоем, водный массив
11. water body	11. бытовые сточные воды
12. sewage	12. продукты отхода
13. decomposable	13. способный к разложению

3. Find the Russian word with the same root as the English:

Образец: activity – деятельность (активность)

community	община
residence	жилье
storm	буря
sanitary	гигиенический
adopt	принимать, усваивать
local	местный
conditions	условия
composition	состав
disinfection	обеззараживание

Supplementary texts

Hot-water supply

The term “central heating” applied to the heating of domestic and other buildings indicates that the whole of a building is heated from a central source, usually an independent boiler, fired by solid fuel, gas, electricity or fuel oil.

In general, a heating system should be designed so that the water will circulate by gravity. In some installations, circumstances are such that a pump or accelerator must be used to achieve a satisfactory circulation. This should be avoided if possible.

When designing a heating system for a large building, it is usual – in the interests of economy and to ensure efficient heating – to first calculate how much heat will be needed to maintain the building at the desired temperature. Then the size of the boiler and the amount of pipe and radiator heating surface required to give out this heat will be estimated. For small systems, “rules-of-thumb” methods and past experience are generally a sufficient guide.

A steam, or a hot water heating plant consists essentially of the radiators, the boiler and the system of piping connecting the former with the latter. Steam or hot water from the boiler is circulated through the piping and radiators: in these the steam condenses giving up its latent heat and the water given up some of its heat, thus warming the rooms. In the usual hot water installation, the boiler, pipes and radiators are kept full of water at all times, an expansion tank being provided to compensate for the increase in volume of water when heated and to prevent explosions in case of generation of too much steam.

Boilers. The boiler is usually placed at the lowest available point in the building, having regard at the same time to the convenience of stoking and delivery of fuel.

The boiler may be one of a number of types. It may be solid one-piece casting, rectangular in form; it may be sectional; or it may be conical in shape and wrought or cast iron. For smaller systems, the first and last-named types are both cheap and suitable. The sectional boiler has the advantage of the possibility of added sections should more heat be needed subsequent to initial installation.

System of piping. For steam heating the systems of piping usually employed are the ordinary one-pipe system and two-pipe system. In the former, but one connection is made to each radiator, this connection serving both as inlet for the steam and an outlet for the water of condensation. In the latter, there is a supply pipe and a return pipe for each radiator. The two-pipe system is expensive, and hot used generally in steam heating except for indirect radiators which must always have two connections in order to function properly.

In hot-water heating, although one-pipe systems may be used, it is considered the best practice to have a supply pipe and a return pipe for each radiator. Rules and tables for computing the size of pipe for both system and hot water heating will be found in handbooks.

In selecting a heating plant for residences there must be considered the size, the type of building, the climate and the first cost of operation.

From the history of dam construction

Dams have a history just as long as such branches of civil engineering as bridge building, road construction and the laying down of canals. Not only do dams represent some of the most impressive achievements of engineers over the centuries but their vital role in supplying water to towns and cities, irrigating dry lands, providing a sources of [power and controlling floods is more than sufficient

to rank dam building among the most essential aspects of man's attempts to harness, control and improve his environment.

In antiquity dams were built as an essential part of the need to practice irrigation on which the production of food was based. It was not until the Roman came on the scene that the size of dams was increased and new uses were found, such as the application of dams to problems of flood control and protection. The most important contribution, however, was the reservoir dam which, to a large extent, was a result of the Roman's concern with the water supply to cities and towns. That they were able to build so many big dams, many of which have lasted for a very long time and survived, despite eighteen centuries of use and neglect, was also a result of their evolving better methods of construction based on better materials, especially hydraulic mortar and concrete. Moreover, proper attention was paid to hydraulic problems to ensure that the water could not percolate through the dams and that when it overflowed them, spillways were provided.

The Industrial Revolution contributed much to the further development of water resources not only for water supply purposes but also for water wheels, and, later, in the 19-th century, for their logical successor- water turbines. In their mode of operation, particularly that of reaction turbines, it was a fundamentally new idea closely linked with an improved understanding of hydrodynamics. The development of electric generators refers to the major scientific discoveries in the early part of the century, and one feature of electric power was of supreme significance, namely, that it is only form of energy in a ready-to-use state which can be transmitted over long distances.

One of the greatest advantages of a water-power station is that it utilizes an energy carrier which renews itself constantly and does not exhaust energy resources. This makes its maintenance costs relatively low.

With the discovery of a generator three separate seemingly diverse branches of engineering, those concerning dams, water turbines and electric generators, came together to found a new branch of power generation utilizing hydropower resources. All the three elements have undergone changes in the height, volume and efficiency.

Model analysis, a technique for stimulating the complex behaviour of a structure, a dam, for instance, promotes a reliable forecast in designing new schemes and in the transformation and modernization of the old ones to increase their efficiencies.

Water-power development – integral part of civil engineering

With the growth of towns and their industries, with the increase of population and the improvement of living conditions the demand for water rises rendering the work of water power engineers ever more important.

There are so many uses for river water that it seems natural it is always made to serve more than one purpose. A large reservoir formed by the dam may be used for flood control, for improving industrial and domestic water supply for nearby areas, for irrigation and navigation, for recreation and sport. To accomplish such miscellaneous tasks a hydro-power development built on the river should comprise besides the dam such structures as a power station, navigation locks, spillway facilities, and canals and tunnels for discharging floods, and other ancillary structures of minor importance.

In harnessing a river to make it serve the man a dam as an impervious barrier should be placed in its way, which impounds water and raises the level of the river thus creating the head necessary for power generation. Since dams are to withstand various stresses, much thought should be given to the problems of increasing their strength, water tightness, stability and safety. It becomes all the more important nowadays as the heights of dams have steadily been increased and this fact calls for a drastic improvement of the methods of design and a deeper knowledge of the foundation character and the properties of the materials used.

Well executed, the dam is of great benefit to the community but if it is not, a dam failure is, perhaps, the most serious man-made catastrophe likely to occur in the peace time. The disasters that took place showed that the mechanism of a dam failure is very complex, that a whole series of effects occur in quick succession. The determination of the true state of stress in a dam undertaken so far now requires a more elaborate treatment as people have come to realize that the best of theories is useless if the materials used do not comply with the assumptions made about their properties.

Modern industrial growth should not be threatened for want of electric energy and this calls for providing better use of resources of various sorts to attain maximum technical and financial efficiency.

Thus the idea of a pumped-storage station using small rivers or basins appeared. The principle of its operation demands storing water in an upper basin and then directing it into a lower basin where from the water is pumped back into the upper basin to repeat the cycle. The scheme demands a special kind of machinery—a reversible pump-turbine type. The station of this kind readily covers

peak energy periods and is most efficient when combined with some other type of power plant.

In some countries for lack of any more economically exploitable water power development the new power demand will be covered by nuclear stations.

Nuclear, conventional thermal and hydropower plants' are complementary, but not mutually exclusive. The problem of high load factor and peak load demands is to be solved by coupling nuclear stations, providing base load energy, with hydropower plants dealing with the peaks. Before arriving at a decision in favour of any of the ways of power generation, the full technical as well as financial aspects (capital investments and fuel costs) should be thoroughly examined.

Systems of heating

Heating. In order to maintain standard room temperature, the heating apparatus must supply heat to replace the lost through the walls, floors, and ceilings, and, in addition, the heat necessary to warm the cold fresh air used for ventilation. Heat is lost by conduction through cracks around doors, windows, etc.

Systems of heating. Leaving stoves and fireplaces out of consideration, the systems ordinarily employed for heating may be classified as follows:

a) hot air

b) steam

c) hot water

Hot air systems. In a hot air system, heated air from the furnace is introduced through leaders, stacks, and registers into the room. This air is at a higher temperature than the room, and, in flowing across the ceilings and down by the walls, heat is abstracted until it is eventually cooled to the desired room temperature. Fresh warm air from the furnace then forces the air that has been cooled to room temperature out of the room through cracks, fireplaces, etc. A heat balance may therefore be written as follows: the heat given up by the entering air equals the heat lost by conduction.

The force which causes hot air to flow from furnace to room results from the difference in densities of the cold air outside and the warm air inside the furnace and pipes.

Advantages. A hot air system is cheap to install, has a low cost of maintenance, and is not hard to manage, its operating cost is little, if any, greater that of hot water or steam system of equal capacity.

Radiant heating

Radiant heating is a technology for heating indoor and outdoor areas. Heating by radiant energy is observed every day, the warmth of the sunshine being the most commonly observed example. Radiant heating as a technology is more narrowly defined. It is the method of intentionally using the principles of radiant heat to transfer radiant energy from an emitting heat source to an object. Designs with radiant heating are seen as replacements for conventional convection heating as well as a way of supplying confined outdoor heating.

Radiant heating heats a building through radiant heat, rather than conventional methods such as radiators (mostly convection heating). The technology has existed since the Roman use of hypocaust heating. Underfloor radiant heating has long been widespread in China and Korea. Another example is the Austrian/German *Kachelofen* or masonry heater. The heat energy is emitted from a warm element, such as a floor, wall or overhead panel, and warms people and other objects in rooms rather than directly heating the air. The internal air temperature for radiant heated buildings may be lower than for a conventionally heated building to achieve the same level of body comfort, when adjusted so the perceived temperature is actually the same. One of the key advantages of radiant heating systems is a much decreased circulation of air inside the room and the corresponding spreading of airborne particles.

The radiant heating systems can be divided into:

Underfloor heating systems—electric or hydronic

Wall heating systems

Radiant ceiling panels

Underfloor and wall heating systems often are called low-temperature systems. Since their heating surface is much larger than other systems, a much lower temperature is required to achieve the same level of heat transfer. This provides an improved room climate with healthier humidity levels. The maximum temperature of the heating surface can vary from 29–35 °C (84–95 °F) depending on the room type. Radiant overhead panels are mostly used in production and warehousing facilities or sports centers; they hang a few meters above the floor and their surface temperatures are much higher.

In the case of heating outdoor areas, the surrounding air is constantly moving. Relying on convection heating is in most cases impractical. The reason being, that once you heat the outside air, it will blow away with air movement. Even in a no-wind condition, the buoyance effects will carry away the hot air. Outdoor radiant heaters allow specific spaces within an outdoor area to be targeted, warming only the people and objects in their path.

The systems can be divided as:

Trace heating- Gutter and Roof De-icing

Snowmelt system- Electric or Hydronic

Overhead natural gas-fired radiant heaters

An example of the overhead radiant heaters are the patio heaters often used with outdoor serving. The top metal disc reflects the radiant heat onto a small area. These are very inefficient and are banned in some countries because of the wasteful use of gas.

Radiant heating can also be used for snow melting and for roof and gutter de-icing applications. Snow and ice melting can be achieved on concrete, asphalt, pavers and other surfaces by placing heating units (electric heating elements or hydronic tubing) under the substrate, embedded into the substrate, or retrofit by saw-cut into the substrate of the surface to be free of snow and ice buildup. For roof de-icing, heating elements can be placed on the surface of the roofing material and some technologies can be placed underneath the roofing materials. Heating elements are used in gutters and downspouts to prevent ice buildup that can cause ice dams and icicles. Radiant heating is also used on roofs to eliminate heavy snow loads that can cause structural damage.

Heat pump and refrigeration cycle

Thermodynamic heat pump cycles or refrigeration cycles are the conceptual and mathematical models for heat pumps and refrigerators. A heat pump is a machine or device that moves heat from one location (the 'source') at a lower temperature to another location (the 'sink' or 'heat sink') at a higher temperature using mechanical work or a high-temperature heat source. Thus a heat pump may be thought of as a "heater" if the objective is to warm the heat sink (as when warming the inside of a home on a cold day), or a "refrigerator" if the objective is to cool the heat source (as in the normal operation of a freezer). In either case, the operating principles are identical. Heat is moved from a cold place to a warm place.

Thermodynamic cycles

According to the second law of thermodynamics heat cannot spontaneously flow from a colder location to a hotter area; work is required to achieve this.[3] An air conditioner requires work to cool a living space, moving heat from the cooler interior (the heat source) to the warmer outdoors (the heat sink). Similarly, a refrigerator moves heat from inside the cold icebox (the heat source) to the warmer room-temperature air of the kitchen (the heat sink). The operating principle of the refrigeration cycle was described mathematically by Sadi Carnot in 1824 as a heat engine. A heat pump can be thought of as heat engine which is operating in reverse.

Heat pump and refrigeration cycles can be classified as vapor compression, vapor absorption, gas cycle, or Stirling cycle types.

Vapor-compression cycle

The vapor-compression cycle is used in most household refrigerators as well as in many large commercial and industrial refrigeration systems. Figure 1 provides a schematic diagram of the components of a typical vapor-compression refrigeration system.

In this cycle, a circulating refrigerant such as Freon enters the compressor as a vapor. The vapor is compressed at constant entropy and exits the compressor superheated. The superheated vapor travels through the condenser which first cools and removes the superheat and then condenses the vapor into a liquid by removing additional heat at constant pressure and temperature. The liquid refrigerant goes through the expansion valve (also called a throttle valve) where its pressure abruptly decreases, causing flash evaporation and auto-refrigeration of, typically, less than half of the liquid.

That results in a mixture of liquid and vapor at a lower temperature and pressure. The cold liquid-vapor mixture then travels through the evaporator coil or tubes and is completely vaporized by cooling the warm air (from the space being refrigerated) being blown by a fan across the evaporator coil or tubes. The resulting refrigerant vapor returns to the compressor inlet to complete the thermodynamic cycle.

The above discussion is based on the ideal vapor-compression refrigeration cycle, and does not take into account real-world effects like frictional pressure drop in the system, slight thermodynamic irreversibility during the compression of the refrigerant vapor, or non-ideal gas behavior (if any).

Vapor absorption cycle

In the early years of the twentieth century, the vapor absorption cycle using water-ammonia systems was popular and widely used but, after the development of the vapor compression cycle, it lost much of its importance because of its low coefficient of performance (about one fifth of that of the vapor compression cycle). Nowadays, the vapor absorption cycle is used only where heat is more

readily available than electricity, such as waste heat provided by solar collectors, or off-the-grid refrigeration in recreational vehicles.

The absorption cycle is similar to the compression cycle, except for the method of raising the pressure of the refrigerant vapor. In the absorption system, the compressor is replaced by an absorber which dissolves the refrigerant in a suitable liquid, a liquid pump which raises the pressure and a generator which, on heat addition, drives off the refrigerant vapor from the high-pressure liquid. Some work is required by the liquid pump but, for a given quantity of refrigerant, it is much smaller than needed by the compressor in the vapor compression cycle. In an absorption refrigerator, a suitable combination of refrigerant and absorbent is used. The most common combinations are ammonia (refrigerant) and water (absorbent), and water (refrigerant) and lithium bromide (absorbent).

Gas cycle

When the working fluid is a gas that is compressed and expanded but does not change phase, the refrigeration cycle is called a *gas cycle*. Air is most often this working fluid. As there is no condensation and evaporation intended in a gas cycle, components corresponding to the condenser and evaporator in a vapor compression cycle are the hot and cold gas-to-gas heat exchangers in gas cycles.

The gas cycle is less efficient than the vapor compression cycle because the gas cycle works on the reverse Brayton cycle instead of the reverse Rankine cycle. As such the working fluid does not receive and reject heat at constant temperature. In the gas cycle, the refrigeration effect is equal to the product of the specific heat of the gas and the rise in temperature of the gas in the low temperature side. Therefore, for the same cooling load, a gas refrigeration cycle will require a large mass flow rate and would be bulky.

Because of their lower efficiency and larger bulk, *air cycle* coolers are not often applied in terrestrial refrigeration. The air cycle machine is very common, however, on gas turbine-powered jet airliners since compressed air is readily available from the engines' compressor sections. These jet aircraft's cooling and ventilation units also serve the purpose of pressurizing the aircraft cabin.

Stirling engine

The Stirling cycle heat engine can be driven in reverse, using a mechanical energy input to drive heat transfer in a reversed direction (i.e. a heat pump, or refrigerator). There are several design configurations for such devices that can be built. Several such setups require rotary or sliding seals, which can introduce difficult tradeoffs between frictional losses and refrigerant leakage.

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Укладач **АНІСЕНКО** Олена Володимирівна

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вул. Революції, 12, Харків, 61002
Електронна адреса: rectorat@kname.edu.ua
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